Section 1 Introduction and Overview

1.1 Background

Monitoring data are a critical part of the Nation's air program infrastructure. In general, the Nation's ambient air monitoring networks:

- inform the public of air quality levels and exposure;
- establish the compliance status of cities and other areas;
- track air quality trends and evaluate progress of emission control programs;
- support development of emission control and air quality research programs.

Monitoring programs, which are operated largely by State and local agencies and Tribal (SLT)Nations, are subject to continual changes in local, State, tribal, Federal and academic priorities. New and revised national ambient air quality standards (NAAQS) and other regulatory needs, changing air quality (e.g., general trend toward reduced concentrations of criteria pollutants), and an influx of scientific findings and technological advancements challenge the response capability of the Nation's networks. The single pollutant measuring approach commonly administered in networks is not an optimal design for recent integrated air quality management trends such as the linkages across ozone, fine particulate matter, regional haze, air toxics, and multi-media interactions (e.g., atmospheric deposition). Indeed, the current design of the Nation's networks still is based largely on the existing monitoring regulations (Code of Federal Regulations, parts 53 and 58) that were developed in the late 1970's.

The United States spends well over $200 million annually on routine ambient air monitoring programs. These include a variety of different networks (see more detailed discussion and maps in **Attachment 1.1**) , with differing objectives:

(1) ***State and Local Air Monitoring Stations (SLAMS) and National Air Monitoring Stations (NAMS).***

SLAMS and NAMS represent the majority of all criteria pollutant (SO_2, NO_2, CO, O_3, Pb, $PM_{2.5}$, PM_{10}) monitoring across the Nation with over 5000 monitors at approximately 3000 sites. These stations use Federal Reference or Equivalent methods (FRM/FEM) for direct comparison to the NAAQS. Design and measurement requirements for these networks are codified in the Code of Federal Regulations (CFR) parts 58 (design and quality assurance), 53 (equivalent methods) and 50 (reference methods). NAMS are a subset of SLAMS that are designated as national trends sites. The NAMS and SLAMS were developed in the 1970's with a major addition of $PM_{2.5}$ monitors starting in 1999 associated with promulgation of the 1997 PM NAAQS. These networks experienced accelerated growth throughout the 1970s with most components exhibiting declines in the number of sites with the exception of ozone and $PM_{2.5}$.

(2) PM$_{2.5}$ Networks

The PM$_{2.5}$ networks includes three major components:

a.) **mass only measurements** through nearly 1100 FRM filter-based mass sites that measure 24 hour averaged concentrations through gravimetry, and approximately 200 continuously operating mass sites using a range of technologies;

b) **chemical speciation measurements** that consists of approximately 50 trend, 250 State Implementation Plan (SIP) and 150 IMPROVE sites, respectively. The vast majority of these sites collect aerosol samples over 24 hours every third day on filters that are analyzed for trace elements, major ions (sulfates, nitrates and ammonium) and organic and elemental carbon fractions. Most of the IMPROVE sites are operated by personnel from the Federal Land Management (FLM) and Forest and National Park Services; and

c) **research "supersites"** executed as cooperative agreements with Universities and EPA that operate over various periods spanning 1999 to 2003 and conduct a wealth of standard and research grade measurements. Supersites are designed to address the extremely complicated sampling issues associated with fine aerosols and constitute an ambitious technology transfer and liaison effort across research level and routine network operations.

3) *Clean Air Status and Trends Network (CASTNET)*

CASTNET originally was designed to account for progress of strategies targeting major electrical generating utilities throughout the Midwest which release acid rain precursor emissions, sulfur and nitrogen oxides. Network operations are contracted out to private firms funded through Science and Technology (S&T) funds and managed by EPA's Office of Air and Radiation. CASTNET consists of approximately 70 sites located predominantly throughout the East with the greatest site densities in States along the Ohio River Valley and central Appalachian Mountains. Aggregate 2-week samples are collected by filter packs and analyzed for major sulfur and nitrogen oxide transformation compounds (e.g., end products such as sulfate and nitrate ions). CASTNET was deployed in the 1980s as part EPA's National Acid Precipitation Assessment Program (NAPAP). A network assessment in the mid-1990's led to a more optimized and less extensive network.

4) *Photochemical Assessment Measurement Stations (PAMS).*

PAMS measures ozone precursors {volatile organic compounds (VOC) and nitrogen oxides (NOx) } which react to form ozone at 75 sites in 25 metropolitan areas that were classified as serious ozone nonattainment coincident with release of the 1990 Clean Air Act (CAA) Amendments. The addition of PAMS in the early to mid- 1990's was a major addition to the national networks, introducing near research grade measurement technologies to produce continuous data for over 50 VOC compounds during summer ozone seasons. More recently, PAMS has been subject to numerous concerns regarding data quality and lack of data analysis applications. Recent efforts have explored stronger linkage to air toxics monitoring as well as identification of more streamlined PAMS requirements.

5) Air Toxics Monitoring Network.

Nearly 250 air toxics sites have been operated by State and local agencies largely through their own initiatives and funding as there are no Federal requirements for air toxics monitoring, and only recently have Federal grant funds been earmarked for toxics monitoring. A steering committee consisting of EPA and State and local agency members has been developing a National Air Toxics monitoring program. The program design effort is starting with a detailed analysis of data from existing sites and recently deployed pilot studies (measuring 18 species) at four major urban locations (Providence, RI; Tampa, FL; Detroit, MI; Seattle, WA) and six small city/rural locations (Puerto Rico; Keeney knob, WV; Cedar Rapids, IA; Grand Junction, CO; Rio Rancho, NM; San Jacinto, CA). While air toxics clearly is a problem of national scope, the problems are highly variable and dependent on local conditions (i.e., emissions mix, topography, meteorology).

Historically, as new monitoring needs develop (e.g., for new criteria pollutants, such as $PM_{2.5}$ in 1997), the focus is on that specific pollutant. The incentives for growth in ambient monitoring activities generally are clear and compelling and based on scientific findings that lead to revision of air quality standards or identification of important measurement gaps. Over time, these have generally been “layered” as one pollutant network upon another, such that we now have an ozone network, a PM_{10} network, a carbon monoxide network, etc. Little thought or consideration has traditionally been given to integration of networks. At a time when resources are becoming more constrained, yet new air monitoring demands are anticipated, EPA, working with SLT tribal representatives, initiated a process to take a comprehensive and holistic look at the way air monitoring in conducted. This process has led to the development of the proposed National Ambient Air Monitoring Strategy (Strategy).

1.2 Purpose

The Strategy seeks to achieve an appropriate balance between needed stability and a desired improvement in response capability to scientific finding and emerging priorities. Assuming limited, at best, resource growth in monitoring programs, serious efforts must be devoted to optimize resources which can meet evolving monitoring challenges. Stability in networks is a positive attribute, as considerable time spans (decadal length) often are required to detect and interpret important air quality trends.

The capability to meet future monitoring needs is problematic given the current network structure.

Therefore, the primary purpose, or "goal," of the Strategy is to manage the Nation's air monitoring networks in a manner that addresses the most pressing public health issues, optimizes efficiency, and accommodates future needs, all within the constraints of the available funding.

1.3 Strategy Development Process

The generation of findings and recommendations within this document was guided by the National Monitoring Strategy Committee (NMSC). The NMSC is a partnership committee among the EPA, and State/local and tribal representatives (SLTs). There are 18 members: seven EPA management level staff; seven representatives from State and local agencies, including the State and Territorial Air Pollution Program Administrators/Association of Local Air Pollution Control Officials (STAPPA/ALAPCO); three tribal representatives; and one facilitator. Since 1999, NMSC members have been meeting on a regular basis to provide the framework for the Strategy. To that end, this document represents the culmination, collectively, of many hundreds of hours of discussions, informational reviews, problem solving, issue resolution, and consensus building.

To support the effort, five technical workgroups were established to probe more deeply into specific components of the Strategy:

(a) Formal workgroups (mix of staff from EPA and SLTs): These groups met as part of a major air monitoring Strategy meeting in October 2001 and have developed key components to the Strategy. The workgroups are as follows:

1. *Regulatory Review Workgroup* (for modifications to 40 CFR part 58 monitoring regulations including changes in required number of criteria pollutant sites).
2. *Quality Assurance Workgroup* (for modifications and recommendations for improved approaches and consistency in quality assurance programs).
3. *Technology Workgroup* (for recommendations to accelerate dissemination of air quality data, and provide a review of EPA's continuous PM implementation plan)

b) Two ad-hoc groups: These groups are linked peripherally to the Strategy development:

1. *Network Assessment Workgroup* (technical staff from EPA and SLTs to review national assessment results; culminated in July 2001 workshop).
2. *National Network Design Workgroup* (a small subset of NMSC members developing details on the proposed National Core network.)

There are also other existing groups which have had input and bearing on the activities of the NMSC. These are:

(1) Air Toxics Monitoring Steering Committee - a group of mostly NMSC members focusing on specific development of an air toxics monitoring program and using the overlapping responsibilities to ensure integration with the Strategy.

(2) Clean Air Scientific Advisory Committee Particulate Matter Monitoring Subcommittee - This group has been advising EPA on all aspects of particulate matter air monitoring. Over the last year an emphasis has been placed on implementing PM continuous monitoring which is a major operational element of this overall Strategy.

Together, the interactions of the committees and workgroups have successfully fostered a process which has substantially enhanced the efforts of the NMSC.

1.4 Operating Principles

Guiding the planning process is a handful of basic principles, agreed to by the NMSC, which form the foundation for the development of the proposed Strategy. These principles emphasize the active use of data and assessments, strong interactive communications, and incorporation of scientific advancements. Each are outlined below:

(1) ***Partnership***: EPA and SLT will jointly lead the planning effort underlying this Strategy.

(2) ***"Zero-Sum" Resource Assumption***: The Strategy is not a vehicle to add significant resources for air measurements. Relatively stable but flat spending is projected for air monitoring activities in the near future. This level-resource assumption can accommodate new air monitoring needs by targeting reductions in current monitoring, primarily for pollutants which are now well below the NAAQS. The Strategy does include some additional resource proposals (i.e., approximately $12-15 million) required to catalyze certain technology and initial implementation elements of the Strategy. Furthermore, this Strategy intends to retain the basic infrastructure and operational stability of existing agencies. Reallocation implies shifts to different pollutant measurements and technologies, and not resource shifts across geographical regimes. Looking toward the longer-term future, a budget analysis process is warranted to assure that funding levels can sustain the Strategy.

(3) ***Flexibility by Balancing National and Local Needs***: Network design, divestment, and investment decisions must achieve a balance between prescription (consistency) and flexibility to accommodate national and local monitoring objectives, respectively. We must recognize that localized issues

are “national” issues, and nationally consistent data bases serve local (SLT agency) interests as well. A national strategy is enhanced by incorporating flexible processes to accommodate a spectrum of local and national objectives. Flexible principles must also be extended to reaching a balance between retaining valued stable network elements and introducing new elements that respond to new priorities.

(4) ***Institutionalize Network Assessments***: While this document incorporates results of broad based assessment of networks, assessments, especially at the regional level, should be performed on a regular basis to ensure the relevancy and stability of network operations.

(5) ***Demonstrate the Value of Data***: Data should be collected only following defined plans for its use, an associated commitment to objective analysis, and an understanding that collection of data determined to be valueless should be discontinued. A realistic understanding of data usage and patience must be exercised, recognizing that beneficial returns often require several years (e.g., identifying trends) of data collection. Implicit is the understanding that challenges to data usefulness must be answered at a minimum with a defined set of analysis plans and commitments. Clearly, if data do not undergo analysis, or plans for doing so are not available, one can only assume that the data have little or no value.

(6) ***Optimization Through Integration***: Monitoring programs often are administered on a program-by-program basis, an approach that does not foster active information flow across monitoring components or the development of truly complementary networks. The administration of programs should be in step with our understanding of the scientific and logistical linkages across programs. For example, the developing air toxics program should be considered an integration of existing programs (e.g., PAMS, $PM_{2.5}$, State/local networks) combined with new initiatives. A wealth of complementary monitoring is performed by other Federal agencies (and other EPA programs) that support air quality program objectives and, in turn, benefit from the traditional program.

(7) ***Effective Interfacing with “Science:”*** An emphasis should be placed on more active engagement with the scientific community, and its products, recognizing the important role science plays in network design and technology and the role of networks in assisting scientific research. The perspective that a clear demarcation exists between science-oriented and agency-based monitoring is counterproductive to optimizing the collective value of research and air monitoring. A major cultural change that should be institutionalized is embracing the scientific community as a partner in planning and advice, as opposed to a limited role of critical review.

(8) ***Minimize Adverse Program Impacts***: This Strategy should maintain integrity of existing agency monitoring programs by emphasizing shifts in programmatic areas (e.g., PAMS to toxics, PM_{10} to PM coarse/toxics, etc.) and, if necessary, phase in gradual reductions in programs.

1.5 Components of the Strategy

The Strategy is comprised of several key components, each of which is an integral and necessary element for success. These are described in greater detail in subsequent sections of this document. The components are:

(1) a clear set of objectives as the foundation for the Strategy (Section 2);

(2) the need and importance of periodic network assessments (Section 3);

(3) the design of the National Core Network (NCore) (Section 4);

(4) a review of quality assurance procedures and recommendations for more efficient quality assurance programs (Section 5);

(5) a look at new air monitoring and data transfer technologies and how those can be incorporated into air monitoring networks (Section 6);

(6) a review and understanding of monitoring capabilities (Section 7);

(7) the regulation review process and what changes will be needed to enable the Strategy (Section 8); and

(8) a communications and outreach program to ensure that agencies, community groups, business and industry, and the general public can be informed as to the benefits of implementing the Strategy (Section 9).

Most of these components are integrated and often co-dependent on each other. For example, national and regional assessments (Section 3) are conducted to provide broad national targets for implementing changes in existing criteria pollutant networks as defined by the objectives for the Strategy, as in Section 2.

1.6 Recommendations

In proposing this Strategy, the NMSC is recommending several key changes to the way air monitoring is conducted. These changes will allow for more efficient collection of air quality data, more universal use of air quality data, and greater flexibility in air monitoring to meet the challenges of the twenty-first century in ways that meet both national and local monitoring needs. The recommendations are:

(1) The atmosphere is a complex mixture of pollutants, and monitoring networks should include a greater level of multi-pollutant monitoring sites;

(2) Continuous measurement technologies, for both gaseous and particulate pollutants, need to become the mainstay of monitoring networks;

(3) The national "core" monitoring network (called NCore) should be able to address all the major demands of air monitoring networks, such as:

- trend determinations;
- reporting to the public;
- assessing the effectiveness of control efforts;
- providing data for health assessments;
- determinations of attainment and nonattainment status;

(6) The network should be flexible enough to meet local air monitoring needs, such as addressing environmental justice concerns, as well as national air monitoring objectives;

(7) The network should improve the ability to rapidly communicate air quality data to the public, using features such as:

- AIRNow;
- State and local agency websites;
- the media (especially TV and radio);

(4) NCore should replace the existing NAMS/SLAMS network terminology;

(5) NCore needs to incorporate scientific data needs to a greater extent than exists under the current network structure;

(6) NCore structure should be three-tiered: [1] a backbone national multi-pollutant monitoring network; [2] an additional set of sites which can be single-pollutant to meet the monitoring needs for key pollutants of concern, such as ozone and $PM_{2.5}$; and [3] a limited number of technically upgraded "supersites" which can accommodate scientific needs, such as new instrument testing; sampling of precursor and intermediate reactionary pollutants; and measurements of airborne biological particles;

(7) There should be approximately 50 to 60 urban, and 10 to 20 rural "backbone" NCore sites. To the degree feasible, each State should have at least one of these sites;

(8) Tribal participation should complement and enhance the network operated by State and local agencies;

(9) Urban sites should be representative of urban-scale conditions, and therefore comparable among the urban areas;

(10) Rural sites should be located so as to represent transport corridors, background conditions, or urban-rural couplet objectives;

(11) The utilization of new technologies is strongly encouraged. NCore should be able to readily accommodate new technologies, both for air pollutant measurements and the rapid transfer of measured data to the public. Where measurement technologies are currently lacking, for example, the direct measurement of diesel particulate matter, research efforts should be encouraged;

(12) There needs to be recognition that, for many criteria pollutants which are now well below the Federal NAAQS in many areas of the country (for example, carbon monoxide, nitrogen dioxide, sulfur dioxide, lead, and even PM_{10}), our understanding of air quality conditions is well characterized. Further, there needs to be recognition that certain pollutants, such as air toxics and $PM_{2.5}$ are not well characterized. Based on our knowledge and need for protection of public health, there exists opportunities to reduce resources for those pollutants which are well characterized and increase resources for those pollutants which are not well characterized;

(13) There needs to be a process whereby air monitoring networks undergo periodic assessments to determine if the existing network structure is optimally meeting national and local objectives. If not, the assessments should be the basis for network changes;

(14) With the exception of the "supersites," the costs for establishing the NCore sites, including the local, flexible sites, should be covered from resource savings in reducing the number of monitors based on the network assessments;

(15) Some elements will require targeted additional funding, including some capital costs for new equipment and establishment of the "supersites."

(16) Recommendations for network changes should engage the public. A strong public communications program is advocated, both at the national and local levels;

(17) In the establishment of NCore, leveraging of existing networks is encouraged to the degree feasible;

(18) A review of existing regulations is needed to identify outdated requirements and enable NCore. Changes should be promulgated by EPA.

1.7 Schedule

The development of the Strategy has taken almost 3 years. In trying to move forward in an expeditious manner, the following schedule has been developed:

Strategy Timeline	
Draft Strategy document for NMSC review	July 2002
NMSC meeting for release of document	July 30, 2002
Draft final document for public comment	Sept.- Oct. 2002
Draft Regional network assessments NMSC Review of Comments and Finalization of the Monitoring Strategy Document	October 2002 January 2003
Final Regional network assessments	March 2003
CASAC review	Est: 2002-2003
Outreach to science and environmental groups	2002 -2003
Monitoring regulations proposal to NMSC	December 2002
Monitoring regulations proposal in Federal Register	June 2003
Monitoring regulations final	December 2003
Deployment	2003 – 2007

1.8 Feedback

This document and the companion "Summary Document" are being made available for review and comment. Any comments should be submitted by November 22, 2002 to:

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OAQPS, C339-02
Research Triangle Park, NC 27711

or e-mail:
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or fax:
(919) 541-1903

The NMSC will review comments prior to finalizing the National Ambient Air Monitoring Strategy Document.

Attachment 1.1 - Overview of the Existing Air Monitoring Networks

The major routinely operating ambient air monitoring networks in the United States include a collection of programs primarily operated by States, local agencies and tribes:

State and Local Air Monitoring Stations (SLAMS) and National Air Monitoring Stations (NAMS)

SLAMS and NAMS represent the majority of all criteria pollutant (SO_2, NO_2, CO, O_3, Pb, $PM_{2.5}$, PM_{10}) monitoring across the Nation with over 5000 monitors at approximately 3000 sites. These stations use Federal reference or equivalent methods (FRM/FEM) for direct comparison to the NAAQS. Design and measurement requirements for these networks are codified in the Code of Federal Regulations (CFR) parts 58 (design and quality assurance), 53 (equivalent methods), and 50 (reference methods). NAMS are a subset of SLAMS that are designated as national trends sites. The NAMS and SLAMS were developed in the 1970's with a major addition of $PM_{2.5}$ monitors starting in 1999 associated with promulgation of the 1997 PM NAAQS. These networks experienced accelerated growth throughout the 1970's with most components exhibiting declines in the number of sites with the exception of ozone and $PM_{2.5}$ (Figure A-1, and also Table 1). Rethinking the design of SLAMS/NAMS is a central topic of this Strategy.

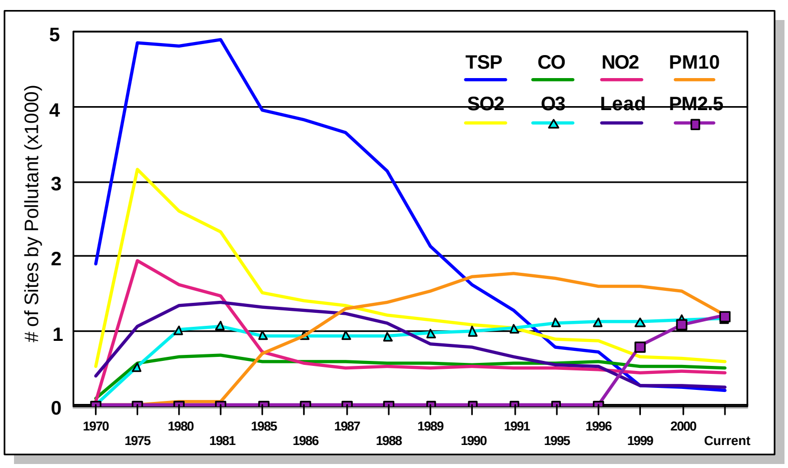

Figure A1. Growth and decline of criteria pollutant networks.

PM$_{2.5}$ networks

The $PM_{2.5}$ networks include three major components (Figure A2):
1) **mass only measurements** through nearly 1100 FRM filter based mass sites (Figure A3) that measure 24 hour averaged concentrations through gravimetry, and approximately 200 continuously operating mass sites using a range of technologies;

2) **chemical speciation measurements** that consists of approximately 50 trend, 250 State Implementation Plan (SIP), and 150 IMPROVE sites (Figure A4), respectively. The vast majority of these sites collect aerosol samples over 24 hours every third day on filters that are analyzed for trace elements, major ions (sulfates, nitrates, and ammonium) and organic and elemental carbon fractions. Most of the IMPROVE sites are operated by personnel from the Federal Land Management (FLM) and Forest and National Park Services. Over the last five years, these networks have been subject to reviews by the National Academy of Sciences (NAS), EPA's Clean Air Scientific Advisory Committee (CASAC), the General Accounting Office (GAO), and the Inspector General's Office. The CASAC review by the particle monitoring subcommittee has been engaged with EPA since 1999. Many of the recommendations related to the introduction of new methodology, particularly increased continuous particle monitoring and the corresponding need to redirect resources from FRM filter methods to continuous and speciation sampling have been addressed in detail through the CASAC subcommittee on particulate matter monitoring; and

3) **8 Supersites** executed as cooperative agreements with Universities and EPA that (city dependent) operate over various periods spanning 1999 to 2003 and conduct a wealth of standard and research grade measurements. Supersites are designed to address the extremely complicated sampling issues associated with fine aerosols and constitute an ambitious technology transfer and liaison effort across research level and routine network operations.

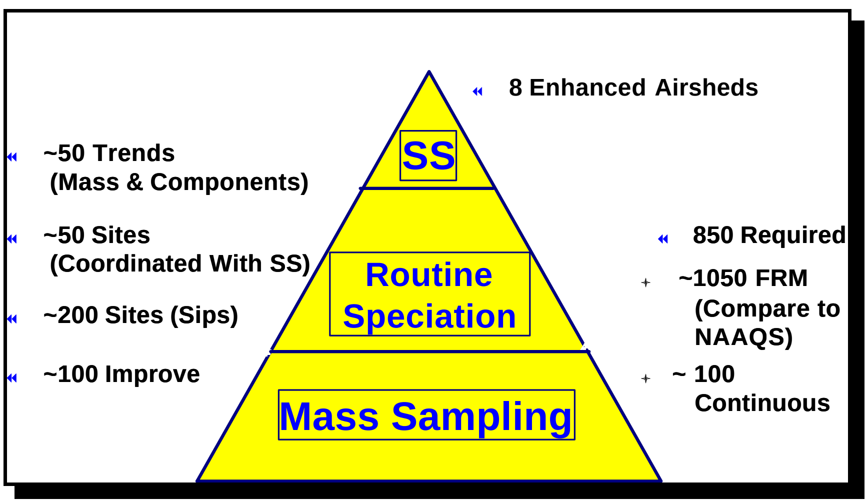

Figure A2. Overview of PM2.5 monitoring network elements.

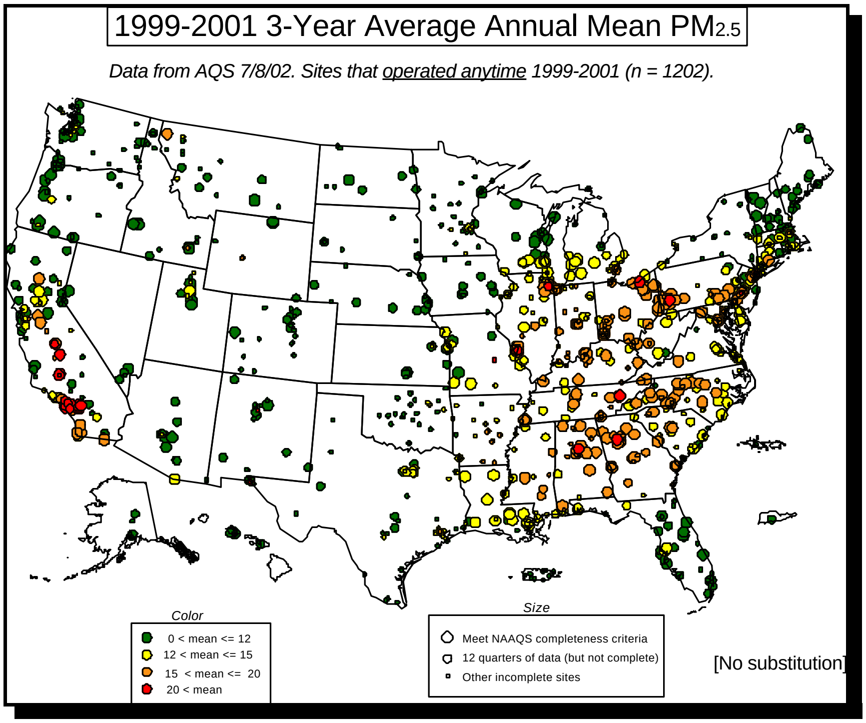

Figure A3. $PM_{2.5}$ Federal Reference Monitoring sites.

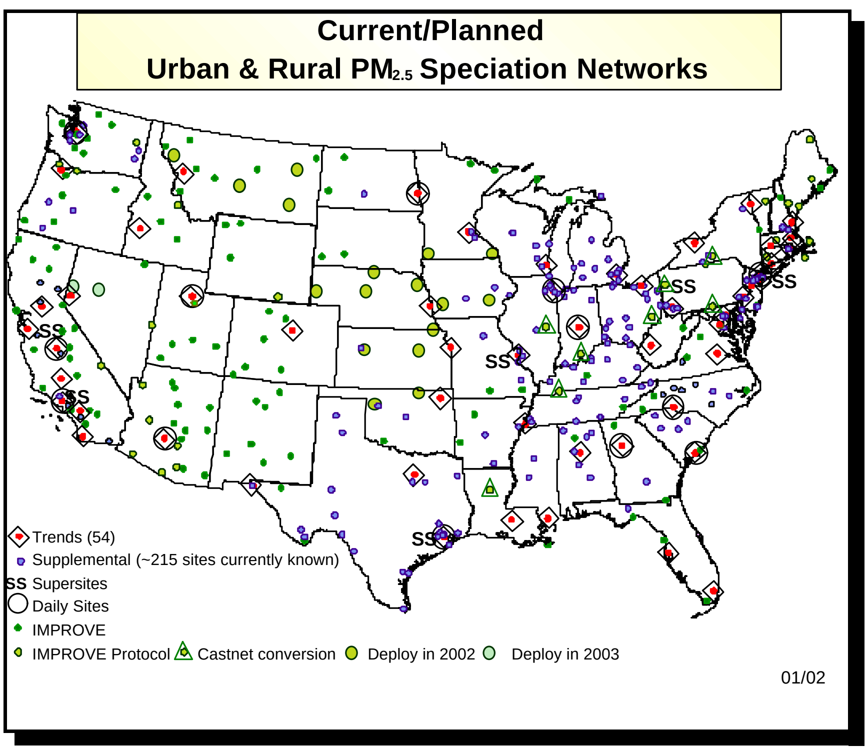

Figure A4. $PM_{2.5}$ chemical speciation sites.

Clean Air Status and Trends Network (CASTNET)

CASTNET originally was designed to account for progress of strategies targeting major electrical generating utilities throughout the Midwest which release acid rain precursor emissions, sulfur, and nitrogen oxides. Network operations are contracted out to private firms funded through Science and Technology (S&T) funds and managed by EPA's Office of Air and Radiation. CASTNET consists of approximately 70 sites located predominantly throughout the East with greatest site densities in States along the Ohio River Valley and cental Appalachian Mountains (Figure A5). Aggregate two week samples are collected by filter packs and analyzed for major sulfur and nitrogen oxide transformation compounds (.e.g, end products such as sulfate and nitrate ions). CASTNET was deployed in the 1980's as part of EPA's National Acid Precipitation Assessment Program (NAPAP). A network assessment in the mid-1990's lead to a more optimized and less extensive network.

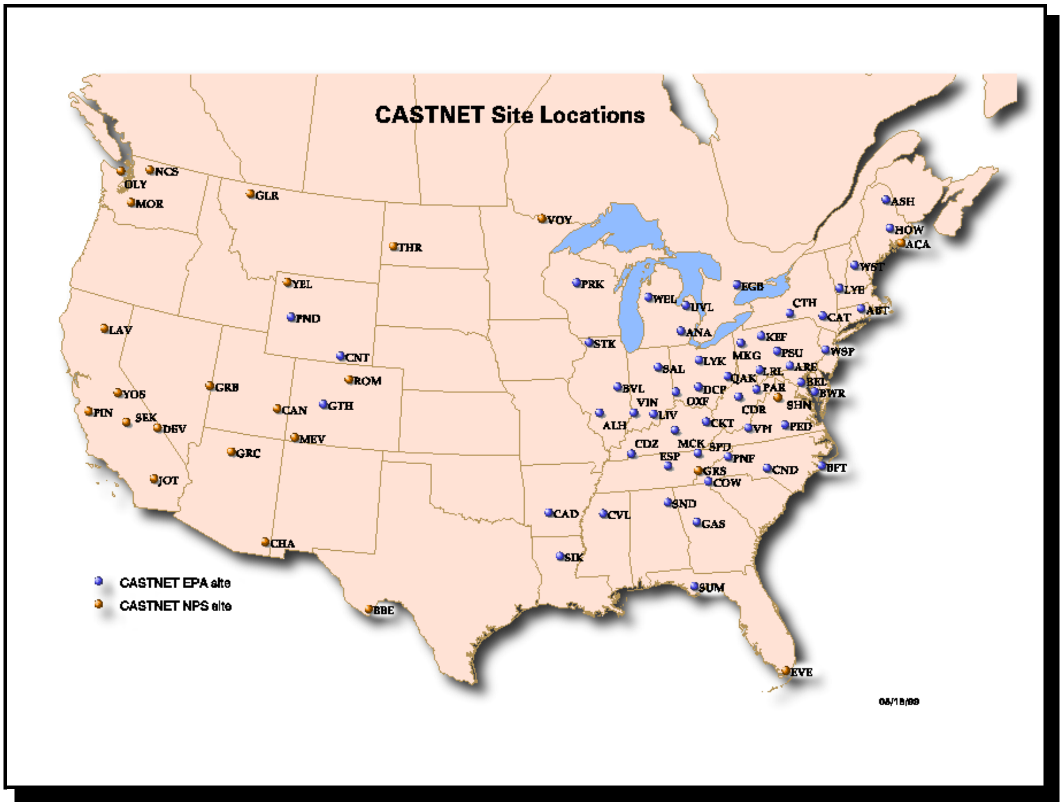

Figure A5. Clean Air Status and Trends Network (CASTNET).

Photochemical Assessment Measurement Stations (PAMS)

PAMS measures ozone precursors {volatile organic compounds (VOC) and nitrogen oxides (NO_x)} which react to form ozone at 75 sites in 25 metropolitan areas that were classified as serious ozone nonattainment coincident with release of the 1990 Clean Air Act (CAA) amendments (Figure A6). The addition of PAMS in the early to mid-1990's was a major addition (and burden to State and local agencies) to the national networks, introducing near research grade measurement technologies to produce continuous data for over 50 VOC compounds during summer ozone seasons. PAMS has been subject to numerous concerns regarding data quality and lack data analysis applications. More recent efforts have explored stronger linkage to air toxics monitoring as well as identification of more streamlined PAMS requirements (Chapter 4).

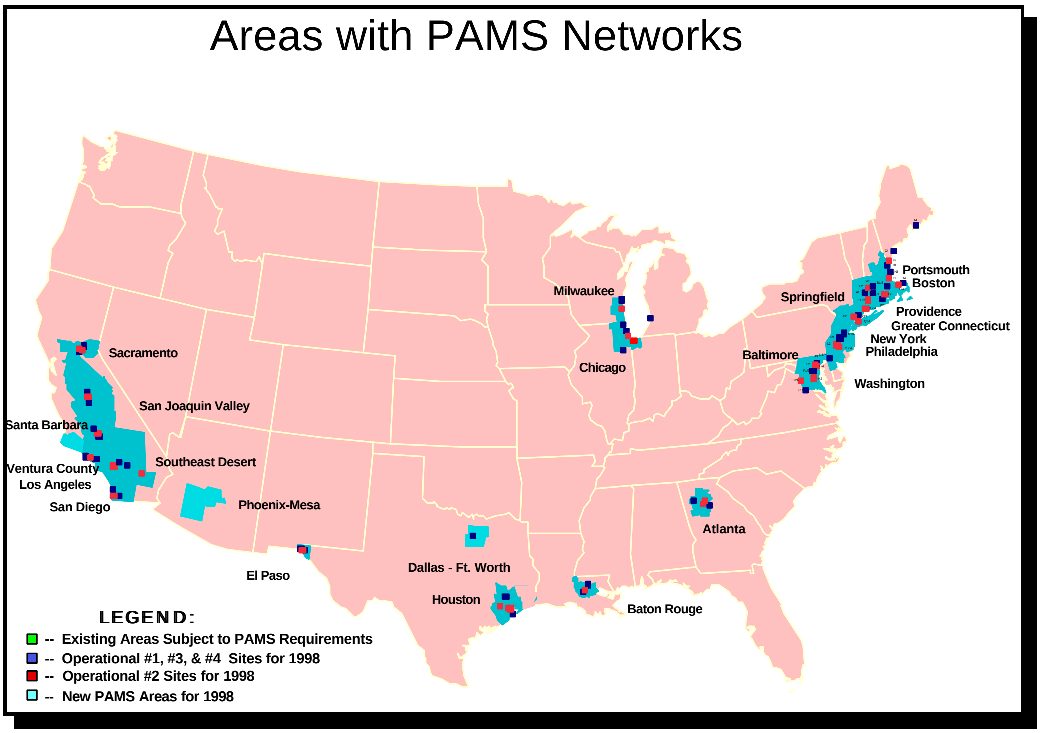

Figure A6. Photochemical Assessment Measurement Stations (PAMS) network.

Air Toxics Monitoring Network

Nearly 250 air toxics sites have been operated by State and local agencies largely through their own initiatives and funding as there are no Federal requirements for air toxics monitoring, and only recently have Federal Grant funds been earmarked for toxics monitoring. A steering committee consisting of EPA, State, and local agency members has been developing a National Air Toxics monitoring program. The program design effort is starting with a detailed analysis of data from existing sites and recently deployed pilot studies (measuring 18 species) at four major urban locations (Providence, RI; Tampa, FL; Detroit, MI; Seattle, WA) and six small city/rural locations (Puerto Rico; Keeney Knob, WV; Cedar Rapids, IA; Grand Junction, CO: Rio Rancho, NM; San Jacinto, CA). While air toxics clearly is a problem of national scope, the problems are highly variable and dependent on location conditions (i.e., emissions mix, topography, meteorology). A majority of resources should be under the discretion of State/local agencies, and tribes to accommodate the variable and localized nature of air toxics across the Nation. A fraction of the program will support a national trends network that measures a limited number of species at perhaps 20-30 locations. Pilot city studies were initiated in 2001 to develop a consistent data base to support a national network design. The steering committee has recommended an initial 10- 20 urban and rural sites to start this network (Figure A7) .

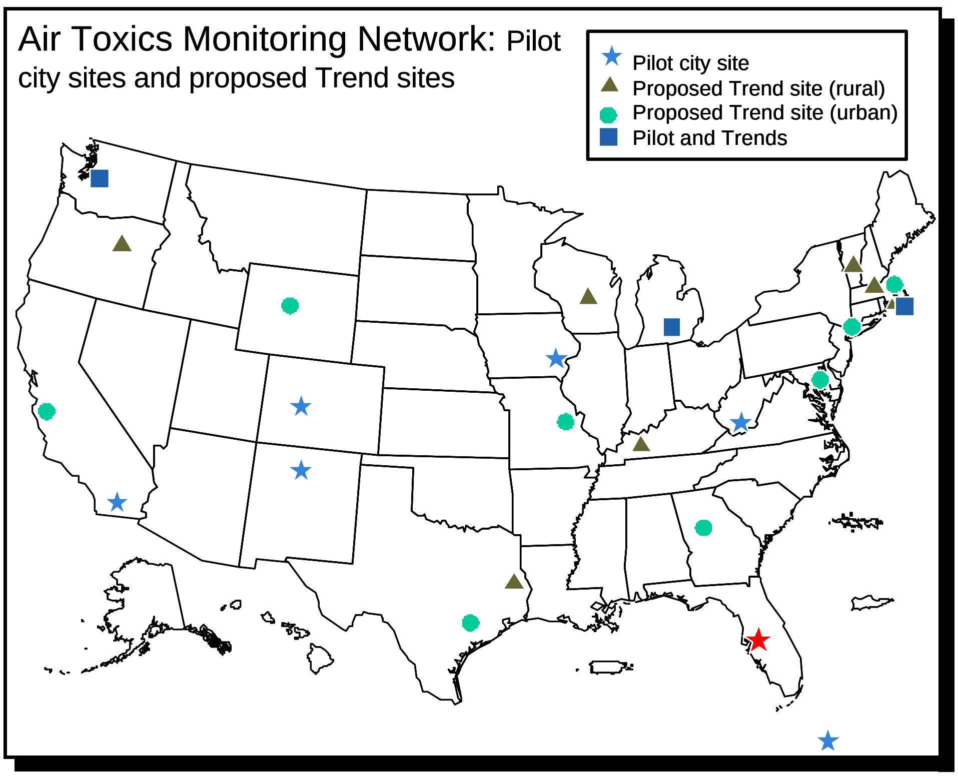

Figure A7. Air Toxics Pilot city sites and Proposed trend site locations.

Tribal Monitoring

Tribal land monitoring (Figure A-6) continues to increase in the number of tribes that operate monitors and the number of parameters that are measured. As of August 2002, approximately 46 sites exist for which some data are report to EPA's AQS. This number will have reached approximately 50 by year's end 2002. Included in this number of 6 ozone monitoring sites; 24 PM_{10} and $PM_{2.5}$ fine mass sites; 2 $PM_{2.5}$ chemical speciation sites. The sites also include a large number of accompanying meteorological measurements and several monitor for VOC and/or toxic chemicals. There are 2 existing IMPROVE fine mass speciation sites for regional haze measurements and 11 more sites should be added within the next year.

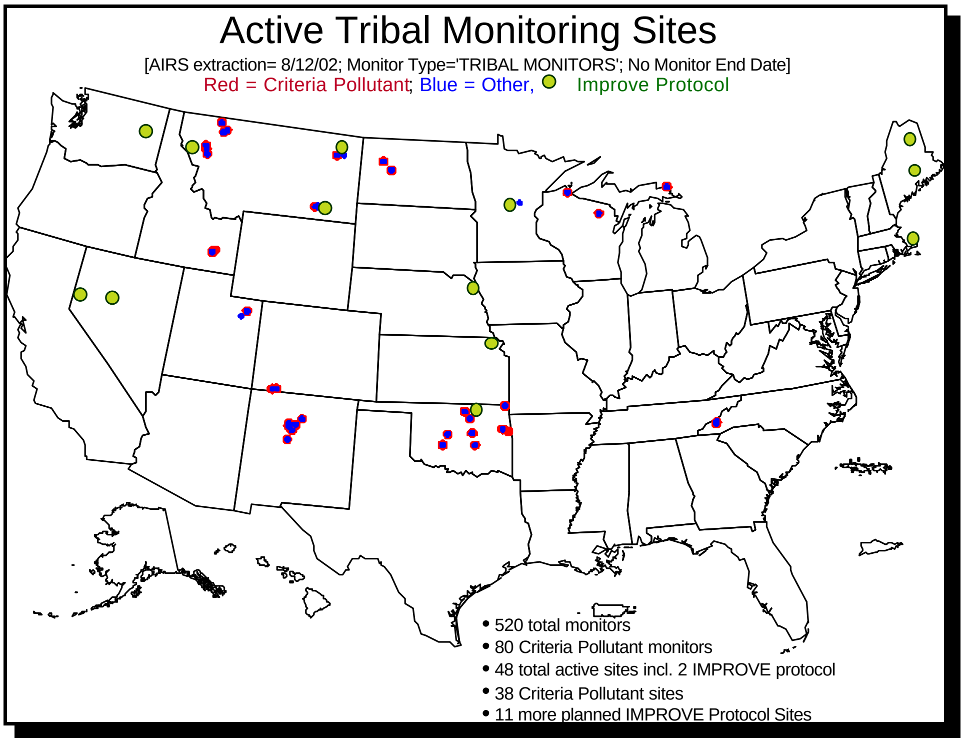

Figure A8. Tribal monitoring stations.

Table A1. Summary table of national ambient air monitoring networks.

SLAMS/ NAMS	Approximate Current Number of Sites	% Measuring > 60% NAAQS	Historical High # Sites	Sampling Reporting Freq. (Year Found Unless Noted)	Notes
Ozone	1167	> 80 (8 hr)	1167 (2002)	hourly (May - September)	
PM2.5	1200	> 75	1200 (2002)	24-hr average; mix of daily, every third day and every sixth day	
PM10	1214	< 25	1763 (1991)	mix of 24-hr. Avg., every sixth day; and hourly	
SO2	592	< 5	3158 (1975)	hourly	
NO2	437	< 5	1944 (1975)	hourly	
CO	498	< 5	684 (1981)	hourly	
Pb	247	< 5	1393 (1981)	24-hr. Avg., every sixth day	
TSP	215	NA	4894 (1981)	24-hr. Avg., every sixth day	
PM2.5					
FRM mass	(1100)				as above
Continuous mass	200	NA		hourly	
Speciation	54 trends; 160 SIP, 140 IMPROVE	NA		mostly 24-hr. Avg.; every third day	major ions (sulfate, nitrate, ammonium); carbon fractions (organic and elemental); trace metals
PAMS	77 sites in 25 MSA's	NA		mix of hourly, 3-hr. Avg. and 24-hr. Average (56 VOC's, TNMOC and carbonyls throughout ozone season	ozone and NO2 include in SLAMS/ NAMS
Toxics	280 (10 National pilot sites)	NA		broad range of metals, VOC's, SVOC's; Pilots: 18 species (metals, VOC's, aldehydes); 24-hr. Avg., every sixth or twelfth day	
CASTNET	70	NA		total nitrate, sulfate, ammonium 2-week avg. samples collected continuously	ozone and IMPROVE measurementsinclud ed above